

URS

Memorangum

Date:

8 July 2002

To:

José Alvarado, BONUS Facility Manager

Copy:

BONUS File

From:

Chad Webb, BONUS RADCON Manager

Subject:

Sampling and Inspection Report for the BONUS Reactor - 2002 Annual Survey

URS Corporation conducted the second comprehensive annual survey at the BONUS Reactor on 12–14 and 20 June 2002 with support from PREPA personnel. This survey was conducted in accordance with the Sampling and Analysis Plan (SAP) for the BONUS Reactor prepared by the U.S. Department of Energy (DOE) (or DOE contractor) as amended by a 16 January 2001 Memorandum from Webb to Alvarado. This report is organized in accordance with Section 6.2 of the SAP. The sampling and inspection results are discussed below.

PURPOSE

Date: 12-14 and 20 June 2002

Purpose: Conduct 2002 annual survey - to ensure that exposure to employees, the public, and the environment to levels of ionizing radiation are as low as reasonably achievable and demonstrate that levels of radioactivity at the facility remain within the criteria that support the basis for continued use as a museum.

LOCATION

This sampling and inspection effort focused on the BONUS Reactor Building. Surveys and inspections were performed on the (1) exterior of the entombment, (2) Main Level, and (3) Basement Level. Air sampling in the Main Level and Basement Level breathing zones was also performed. A list of specific survey locations is provided in Table 1.

PHYSICAL CONDITION

Primary Reactor Building Structure (Dome): Inspection of the primary reactor building structure did not reveal any significant discrepancies, although in the basement minor corrosion was noted around the entire base of the dome. Ongoing and routine assessment of the dome is recommended. No immediate action is necessary.

Entombment: Inspection of the entombment area revealed superficial cracks throughout the surface of the structure. All dose rate measurements taken around the structure were not significantly different from background measurements taken. Ongoing and routine assessment of the entombment is recommended. No immediate action is necessary.



Table 1

	Sample	Dose Rate	Total Contamination	Removable Contamination	
Sampling Location	Number	(uR/hour)	(dpm/100 cm ²)	(dpm/100 cm ²)	Comments
Routine Sampling Pipe Chase Face	1	3	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Pipe Chase Face	2	4	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Pipe Chase Face	2 Dup	NA NA	<mda< td=""><td>NA NA</td><td>Duplicate Top</td></mda<>	NA NA	Duplicate Top
Pipe Chase Face	3 3	3.5	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Pipe Chase Face	4	4	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Top Plug Face #1	5	5	<mda< td=""><td><mda< td=""><td>Entomoment Top</td></mda<></td></mda<>	<mda< td=""><td>Entomoment Top</td></mda<>	Entomoment Top
Top Plug Face #1	6	5	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Top Plug Face #1	7	4	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Top Plug Face #2	7 Dup	NA NA	<mda< td=""><td>NA NA</td><td>Duplicate Duplicate</td></mda<>	NA NA	Duplicate Duplicate
Top Plug Face #2	8 8	4	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Top Plug Face #2	9	5	1,460	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
	10	5			Entombment Top
Top Plug Face #2	11	4	1,022	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Top Plug Face #3 Top Plug Face #3	12	4	1,508 1,168	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
		4	NA	NA NA	
Top Plug Face #3	12 Dup	3.5	<mda< td=""><td><mda< td=""><td>Duplicate</td></mda<></td></mda<>	<mda< td=""><td>Duplicate</td></mda<>	Duplicate
Top Plug Face #3		NA	NA	<mda< td=""><td>Entombment Top Duplicate</td></mda<>	Entombment Top Duplicate
Top Plug Face #3	13 Dup	3	<mda< td=""><td><mda< td=""><td></td></mda<></td></mda<>	<mda< td=""><td></td></mda<>	
Top Plug Face #4	14				Entombment Top
Top Plug Face #4	15	3.5	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Top Plug Face #4	16	4	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Top Plug Top Surface	17	2	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Top Plug Top Surface	18	2	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Top Plug Top Surface	19	2	<mda< td=""><td><mda< td=""><td>Entombment Top</td></mda<></td></mda<>	<mda< td=""><td>Entombment Top</td></mda<>	Entombment Top
Main Floor Water Column	20	4	<mda< td=""><td><mda< td=""><td>Main Level-Controlled Area</td></mda<></td></mda<>	<mda< td=""><td>Main Level-Controlled Area</td></mda<>	Main Level-Controlled Area
Main Floor Water Column	21	4	1,168	<mda< td=""><td>Main Level-Controlled Area</td></mda<>	Main Level-Controlled Area
Instrument Thimble #1	22	4	<mda< td=""><td><mda< td=""><td>Main Level-Controlled Area</td></mda<></td></mda<>	<mda< td=""><td>Main Level-Controlled Area</td></mda<>	Main Level-Controlled Area
Instrument Thimble #2	23	4	<mda< td=""><td><mda< td=""><td>Main Level-Controlled Area</td></mda<></td></mda<>	<mda< td=""><td>Main Level-Controlled Area</td></mda<>	Main Level-Controlled Area
Instrument Thimble #2	23 Dup	4	NA NA	NA NA	Duplicate No. 1 Co. 1 1 1 4
Instrument Thimble #3	24		<mda< td=""><td><mda< td=""><td>Main Level-Controlled Area</td></mda<></td></mda<>	<mda< td=""><td>Main Level-Controlled Area</td></mda<>	Main Level-Controlled Area
Pipe Chase Ext Hatch	25	4	<mda< td=""><td><mda< td=""><td>Main Level-Controlled Area</td></mda<></td></mda<>	<mda< td=""><td>Main Level-Controlled Area</td></mda<>	Main Level-Controlled Area
Instrument Thimble #4	26	4	<mda< td=""><td><mda< td=""><td>Main Level-Controlled Area</td></mda<></td></mda<>	<mda< td=""><td>Main Level-Controlled Area</td></mda<>	Main Level-Controlled Area
Fuel Pool Purif Floor, area	27	21	28,418	<mda< td=""><td>Main Level-Controlled Area</td></mda<>	Main Level-Controlled Area
Fuel Pool Purif Floor, area	27A	6	1,460	<mda< td=""><td>Main Level-Controlled Area. Taken to define elevated area associated with 27 and 28.</td></mda<>	Main Level-Controlled Area. Taken to define elevated area associated with 27 and 28.
Fuel Pool Purif Floor, area	27B	. 5	1,460	<mda< td=""><td>Main Level-Controlled Area. Taken to define elevated area associated with 27 and 28.</td></mda<>	Main Level-Controlled Area. Taken to define elevated area associated with 27 and 28.
Fuel Pool Purif. Floor (CM005)	28	27	<u>9,976</u>	<mda< td=""><td>Main Level-Controlled Area</td></mda<>	Main Level-Controlled Area
Pre heater Room Moat Surface	29	7	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Pre heater Room Moat Surface	29A	8	1,752	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Liq. Waste Ret. Tank Floor	30	17	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Liq. Waste Ret. Tank Floor (Near Wall)	30A	40	2,141	<mda< td=""><td>Basement Level</td></mda<>	Basement Level



Table 1 (Continued)

			Total	Removable	
	Sample	Dose Rate	Contamination	Contamination	
Sampling Location	Number	(uR/hour)	(dpm/100 cm ²)	(dpm/100 cm ²)	Comments
Routine Sampling (continue		[(me a m = 12)			And the second s
Liquid Waste Ret. Tank	31	19	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Floor				*	
Corridor Moat Surface	32	9	924	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Corridor Moat Surface	33	11	7,591	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Corridor Moat Surface	34	10	4,234	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Corridor Moat Surface	35	15	26,472	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Corridor Moat Surface	36	5	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Corridor Moat Surface	37	5	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Liquid Waste Pumb Room	38	15	10,073	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
(B003)		}			
F.W. Heater Room Floor	39	8	1,849	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
F.W. Heater Room Floor	40	9	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
(B017)					
F.W. Heater Room (Wall)	40A	29	312,506	1,139	Appears to be B017 hot spot
1					referenced in the historical
		1			survey (not location 40)
F.W. Heater Room (Wall)	40A Dup	29	293,090	NA	Duplicate
F.W. Heater Room (Floor)	40B	28	36,204	409	Basement Level
F.W. Heater Room (Floor)	40B Dup	NA	NA	358	Duplicate
F.W. Heater Room Floor	41	10	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Vapor Sphere Room	42	5	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Vapor Sphere Room	43	6	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Vapor Sphere Room	43 Dup	NA	NA	<mda< td=""><td>Duplicate</td></mda<>	Duplicate
Air Ejector Room Floor	44	9	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Air Ejector Room Floor	45	NA	NA	NA	Under Water
Condensate Pump room	46	13	1226	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Floor			•		
Hogging Pump Room Floor	47	15	3,260	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Hogging Pump Room Floor	48	8	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Condenser Room Floor	49	10	<u>7,056</u>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Condenser Room Floor	50	9	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Condenser Room Entry Wall	50A	6	41,508	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
(Block)					
Condenser Room Entry Wall	50B	6	<u>45,937</u>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
(Concrete)					
Cond. Purif. Floor Area	51	12	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Cond. Purif. Floor Area	51 Dup	NA	NA	<mda< td=""><td>Duplicate</td></mda<>	Duplicate
Cond. Purif. Floor Area	52	7	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Cond. Resin Regen. (B023)	53	14	<u>24,136</u>	248	Basement Level
Cond. Resin Regeneration	54	14	3,358	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Reactor Water Purification	55	6	973	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Reactor Water Purification	56	5	<mda< td=""><td><mda< td=""><td>Basement Level</td></mda<></td></mda<>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level



Table 1 (Continued)

			Total	Removable	
0 10 10 10 10 10 10 10 10 10 10 10 10 10	Sample	Dose Rate	Contamination	Contamination	
Sampling Location	Number	(uR/hour)	(dpm/100 cm ²)	(dpm/100 cm ²)	Comments
Additional Sampling Location		1 371			T
Reactor Top (MEZI) Fuel Transfer Assembly Track	57	NA	NA	NA	Item removed prior to this survey
Monitoring Well 1	58	NA	NA	NA	No longer included in survey
Monitoring Well 2	59	NA	NA	NA	No longer included in survey
Monitoring Well 3	60	NA	NA	NA	No longer included in survey
Soil Sample 1-North entrance	61	NA	NA	NA	No longer included in survey
Soil Sample 2-South entrance	62	NA	NA	NA	No longer included in survey
Soil Sample 3-Surface composite adjacent to facility	63	NA	NA	NA	No longer included in survey
Composite Dust Sample	64	NA	NA	NA	No longer included in survey
Random Sampling (Specify 1		1 1711	11/1	1477	in longer meruded in survey
Main Floor-Zone 1	65	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 2	66	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 3	67	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 4	68	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 5	69	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Basement-Liquid Retention Tank #1	70	NA	NA	<u>>MDA</u>	Basement Level. Masslin Smear
Basement-Liquid Retention Tank #2	71	NA	NA	<u>>MDA</u>	Basement Level. Masslin Smear
Other Special Readings (As I	Required) :	Specify Local			
Main Floor-Zone 6	72	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 7	73	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 8	74	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 9	75	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 10	76	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 11	77	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 12	78	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 13	79	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear
Main Floor-Zone 14	80	NA	NA	<mda< td=""><td>Main Level-Public Access. Masslin Smear</td></mda<>	Main Level-Public Access. Masslin Smear



Table 1 (Continued)

Sampling Location	Sample Number	Dose Rate (uR/hour)	Total Contamination (dpm/100 cm ²)	Removable Contamination (dpm/100 cm ²)	Comments
Other Special Readings (Con	tinued)			·	
Basement-Liquid Retention Tank #3	81	NA	ŅA	>MDA	Basement Level. Masslin Smear
Basement-Neutralization Tank	81A	NA	NA	<mda< td=""><td>Basement Level. Masslin Smear</td></mda<>	Basement Level. Masslin Smear
Basement-Area to left of stairs	82	14	<u>21,411</u>	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Basement (Near 40A)	83	27	Skipped	Skipped	Known removable contamination – avoided
Decontamination Room, Decontamination Sink Pipe	84	5	10,365	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Decontamination Room, Decontamination Sink Pipe	84 Dup	5	10,365	NA	Duplicate
Sink	85	12	70,754	161	Basement Level
Sump Pump #1	86	11	28,905	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Inlet Air Plenum Room Drain	87	15	5,255	<mda< td=""><td>Basement Level</td></mda<>	Basement Level
Inlet Air Plenum Room Floor area	88	14	11,192	<mda< td=""><td>Basement Level</td></mda<>	Basement Level

NA = Not Applicable

MDA = Minimum Detectable Activity

Main Level (Controlled Area): Inspection of the main level revealed that the two historical contamination sites had been covered with floor tiles; the tile work is in excellent condition and is effective in reducing the dose levels. One area adjacent to the north side of the entombment is also covered with lead bricks, which is also effective in reducing elevated dose rule levels in this area. Ongoing and routine assessment of the floor tile and lead bricks in this area is recommended. No immediate action is necessary.

Basement Level: Inspection of the basement indicated the area had been flooded since the last inspection (January 2001). Corrosion is evident on all surfaces within approximately 6 in. of the floor, including contaminated surfaces. Ongoing and routine assessment of contaminated surfaces in the basement is recommended to determine whether contamination is becoming removable.

DIRECT RADIATION MONITORING

Table 1 presents direct radiation monitoring results for this survey. Attachment 1 provides survey records and sketches depicting survey locations for the direct radiation monitoring conducted during this annual comprehensive survey. Measurements were taken with a Ludlum Micro-R Meter, Model 19, at 30 cm from the source or survey location. Table 2 summarizes these results.

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			1 41010 2				
	Dose Rat	e at 30 cm fro (uR/hour)	om Source	Expected Ex	Annual Dose Limits (rem/year)		
Location	Min. (uR/hour)	Ave, (uR/hour)	Max. (uR/hour)	Max. Exposure (hour/year)	Rate (rem/year)	Rad Worker	Visitor
Entombment Top	2	3.7	5	416	0.002	2	NA
Main Level (Controlled Area)	4	7.9	27	416	0.01	2	NA
Main Level (Public Access)	4	5	6	2,080 (employee)	0.01	2	NA
				832 (visitor)	0.005	NA	0.1
Basement Level	4	12.2	40	416	0.02	2	NA

^aBased conservatively on the maximum-recorded dose rate at a conservative exposure scenario. For example, exposure level for the entombment top would be 5 uR/hour \times (1 rem/1,000,000 uR) \times (8 hours/1 week) \times (52 weeks/1 year) = 0.002 rem/year.

The results summarized in the table above indicate that there are no radiation areas as defined in 40 CFR 835 (0.005 rem/hour at 30 cm or 5,000 uR/hour at 30 cm for the dose rate measurements conducted at BONUS) in the BONUS Reactor facility. The highest dose rate recorded at 30 cm in the BONUS facility (40 uR/hour) is less than 1% of the limit defining a radiation area. The radiation levels exhibited throughout the facility do not approach annual dose limits for radiological workers or site visitors based on conservative exposure scenarios summarized in the table above. It is recommended, however, that the Main Level (Controlled Area), Entombment Top, and Basement Level remain designated as controlled areas (as defined in 40 CFR 835) due to the presence of elevated dose rate areas.

Instrument calibration records and daily response check records are provided in Attachment 2 to provide documentation pertaining to quality instrument performance. Duplicate field measurements were also made at a rate of 5% and are summarized in Table 3.

Table 3

	Result (u	R/hour)				
Location	Initial	Duplicate	RPD (%)	Comments		
12	4	4	0	Very good		
23	4	4	0	Very good		
40A	29	29	0	Very good		
84	5	5	0	Very good		

RPD = $[(Sample - Duplicate)/((Sample + Duplicate)/2)] \times 100$

All quality assurance (QA)/quality control (QC) checks performed within limits.

CONTAMINATION LEVEL MONITORING

Table 1 presents contamination level monitoring results for this survey. Attachment 1 provides contamination survey records and sketches depicting survey locations for the surface contamination measurements conducted during this annual comprehensive survey. Measurements were taken with a Ludlum 44-9 probe coupled to a Ludlum 2221 Scaler/Ratemeter. Total surface and removable contamination surveys were conducted in accordance with Standard Operating Procedures (SOPs) PBR-11.3.1 and 11.4.1. Contamination level results are summarized below.



Entombment

There are no radioactive contamination areas (as defined in 10 CFR 835) associated with the exterior of the entombment structure. Smear samples were collected from the surface of the entombment to assess transferable or removable surface beta/gamma contamination. None of the smear samples exhibited removable contamination above the minimum detectable activity (MDA). Four survey locations exhibited total surface contamination levels above the MDA. Survey locations 9, 10, 11, and 12 had total surface beta/gamma contamination levels ranging from 1,022 to 1,508 disintegrations per minute (dpm)/100 cm². These values are approximately twice background values, but are well below the survey action level for total surface beta/gamma contamination (5,000 dpm/100 cm²). It is recommended that the Entombment Top be designated as a controlled area due to the presence of elevated fixed surface beta/gamma contamination levels. Marking/posting of this area is not required; however, administrative procedures should be in place to ensure that no intrusive (disturbing the entombment surface) work is performed on this level without review and approval by the RCM.

Main Level (Controlled Area)

There are no radioactive contamination areas associated with the controlled area (inside the railing and Plexiglas) of the Main Level. Smear samples were collected from the floor surface of the Main Level (controlled area) to assess transferable or removable surface beta/gamma contamination. None of the smear samples exhibited removable contamination above MDA. However, two planned survey locations, 27 and 28, had total surface beta/gamma contamination levels above the 5,000 dpm/100 cm² action level (28,418 and 9,976 dpm/100 cm², respectively). Two additional survey locations, 27A and 27B, were added to the sampling locations in 2001 and assessed to determine the extent of the surface contamination (refer to survey sketch in Attachment 1). One other planned survey location, 21, exhibited total surface contamination levels above MDA, but below the 5,000 dpm/100 cm² action level. It is recommended that the Main Level (controlled area) remain designated as a controlled area due to the presence of elevated fixed surface beta/gamma contamination and be marked/posted in accordance with Section 6.7 of SOP PBR-11.1.4 (modify posting to avoid alarming visitors — current posting is acceptable). Minimum entry/exit requirements for this area should include signing a log-in/log-out sheet and frisking feet, as well as other areas/equipment that contacted area surfaces, upon exit from the area.

Main Level (Public Access Area)

The Main Level (public access area) was evaluated for transferable/removable surface contamination only (i.e., only smear samples were performed). These results indicate that there are no radioactive contamination areas associated with the public access area (outside the railing and Plexiglas) of the Main Level. Masslin samples (survey locations 65–69 and 72–80) were collected from the floor surface of the Main Level (public access area) to assess transferable or removable surface beta/gamma contamination. None of the smear samples exhibited removable contamination above MDA. Historically, fixed surface contamination does exist on the concrete floor of the Main Level (public access area), but has been shielded by the placement of tiles in this area. Due to the presence of fixed contamination beneath the floor tiles, it is recommended that this area remain a controlled area. Marking/posting of this area is not required; however, administrative procedures should be in place to ensure that no intrusive (disturbing the floor surface) work is performed on this level without review and approval by the RCM.



Basement Level

Table 1 indicates several total and removable surface contamination areas above action levels in the Basement Level. Historically, removable surface contamination in the Basement Level has been detected on floors and process equipment. Figure 1 shows past results of masslin smears performed on floor surfaces, which were determined during historical surveys to have removable contamination above MDA, but below the 1,000 dpm/100 cm² action level. Figure 1 also provides a summary of 100 cm² smear samples collected during previous surveys on equipment located in the basement. Historically, two of the locations (Neutralization Tank and Retention Tank Room) were above the 1,000 dpm/100cm² action level.

Survey locations were added to the Retention Tank Room to further assess this area. A masslin smear was collected from all four tanks in this room (Liquid Retention Tanks 1, 2, and 3 and Neutralization Tank). All three liquid retention tanks exhibited removable contamination above MDA, but the Neutralization Tank masslin smear was below MDA. Additional masslin smears were collected from Tank 1 Zones 1, 2, 3, 4, and tank top. Each of these masslin smears had results greater than MDA. Following the masslin smears, four traditional smear samples were collected from Liquid Retention Tank 1 and ranged from 285 to 5,416 dpm/100 cm². These results indicate that removable contamination is persistent on the liquid retention tanks.

The area associated with historical survey location number B017 (survey locations 40A and 83) was also further assessed to define the area with removable contamination. Initially, two masslin smears were performed in the area with elevated total surface contamination and the area just outside elevated total surface readings, 40AMAS1 and 40AMAS2, respectively (refer to sketch in Attachment 1). As expected, 40AMAS1 exhibited removable contamination levels above MDA and 40AMAS2 below MDA for the masslin smears collected. Following the masslin smears, seven traditional smears (40A through 40G) were collected in this area (refer to sketch in attachment 1). The results of the smear counting ranged from less than MDA to 372 dpm/100 cm². Note, however, that the original smear sample for 40A in Table 1 resulted in 1,139 dpm/100 cm². This area will continue to be monitored and considered a contamination area.

Total beta/gamma surface contamination levels throughout the Basement Level were also elevated. The results of the total surface contamination survey for the basement are summarized in Table 4.

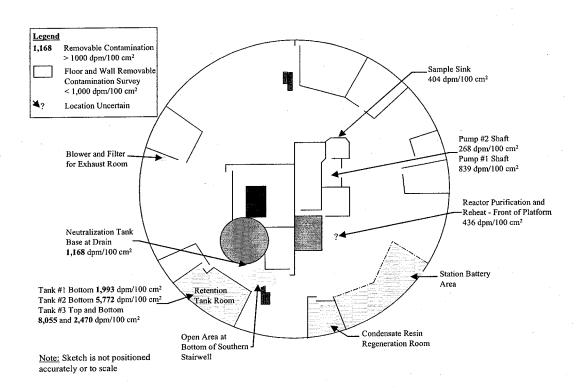


Figure 1. Basement Level: Historical Removable Contamination Survey Results (Source: Jacobs EM Team, February 1998)

Table 4

		010 1		
Total Surface Contamination (dpm/100 cm²)	Survey Location(s) ^a	Low (dpm/100 cm ²)	Average (dpm/100 cm²)	High (dpm/100 cm²)
< MDA	29,30, 31, 36, 37, 40, 41, 42, 43, 44, 48, 50, 51, 52, and 56	< MDA	< MDA	< MDA
MDA - 5,000	29A, 30A, 32, 34, 39, 46, 47, 54, and 55	924 (Loc. 32)	2,191	4,234 (Loc. 34)
5,001 – 50,000	33, 35, 38, 40B, 49, 50A, 50B, 53, 82, 84, 86, 87, and 88	5,255 (Loc. 87)	21,239	45,937 (Loc. 50B)
> 50,000	40A and 85	70,754 (Loc. 85)	191,630	312,506 (Loc. 40A)

^aContamination survey was not performed at planned locations 45 and 83. There was standing water over location 45, and since location 83 is a known removable contamination area, this location was skipped to reduce contaminated waste.

Due to the presence of elevated total surface contamination levels throughout the basement area, it is recommended that the Basement Level be designated as a controlled area and be marked/posted in accordance with Section 6.7 of SOP PBR-11.1.4. All areas with fixed contamination should be marked as "CAUTION, FIXED CONTAMINATION." Entry points to the Basement Level should be posted as "RWP REQUIRED FOR ALL OPERATIONS LIKELY TO RELEASE CONTAMINATION AFFIXED TO SURFACES." Minimum entry/exit requirements for the Basement Level should include signing a log-in/log-out sheet (see Attachment 3), frisking station, and rubber over-shoes or booties. In addition, the following areas should be posted as contamination areas in accordance with Section 6.6 of SOP PBR-11.1.4:

- Room labeled on some drawings as "Area for Reactor LGV Station" (refer to survey locations 40A and 83), and
- Retention Tank Room due to 2002 annual and historical survey results.

Contamination Survey QA/QC

Instrument calibration records and daily response check records are provided in Attachment 2 to provide documentation pertaining to quality instrument performance. Duplicate field measurements were also made at a rate of 5% and are summarized in Table 5.

Table 5

Location	Result (dp	m/100 cm ²)			
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40B	409	358	13.3	Good	
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7	<mda< td=""><td><mda< td=""><td>0</td><td>Good</td></mda<></td></mda<>	<mda< td=""><td>0</td><td>Good</td></mda<>	0	Good	
40A	312,506	293,090	6.4	Good	
84	10,365	10,365	0	Good	

RPD = $[(Sample - Duplicate)/[(Sample + Duplicate)/2)]] \times 100$



All QA/QC checks performed within limits.

LABORATORY DATA

None.

RECOMMENDATIONS

The recommendations provided throughout this report are summarized below:

- It is recommended that the Entombment Top be designated as a controlled area due to the presence of elevated fixed surface beta/gamma contamination and exposure rate levels. Marking/posting of this area is not required; however, administrative procedures should be in place to ensure that no intrusive (disturbing the entombment surface) work is performed on this level without review and approval by the RCM.
- It is recommended that the Main Level (controlled area) remain designated as a controlled area due to the presence of elevated fixed surface beta/gamma contamination and exposure rates and be marked/posted in accordance with Section 6.7 of SOP PBR-11.1.4 (modify posting to avoid alarming visitors current posting is acceptable). Minimum entry/exit requirements for this area should include signing a log-in/log-out sheet (see Attachment 3) and frisking feet, as well as other areas/equipment that contact area surfaces, upon exit from the area.
- Due to the presence of fixed contamination beneath the floor tiles, it is recommended that the
 Main Level (public access area) remain a controlled area. Marking/posting of this area is not
 required; however, administrative procedures should be in place to ensure that no intrusive
 (disturbing the floor surface) work is performed on this level without review and approval by
 the RCM.
- Due to the presence of elevated total surface contamination levels throughout the basement area, it is recommended that the Basement Level be designated as a controlled area and be marked/posted in accordance with Section 6.7 of SOP PBR-11.1.4. The entire Basement Level should be marked as "CAUTION, FIXED CONTAMINATION." Entry points to the Basement Level should be posted as "RWP REQUIRED FOR ALL OPERATIONS LIKELY TO RELEASE CONTAMINATION AFFIXED TO SURFACES." Minimum entry/exit requirements for the Basement Level should include signing a log-in/log-out sheet (see Attachment 3), frisking station, and rubber over-shoes or booties. Note that an RWP is not required for the general basement level for activities that are non-intrusive. In addition, the following areas should be posted as contamination areas in accordance with Section 6.6 of SOP PBR-11.1.4:
 - Room labeled on some drawings as "Area for Reactor LGV Station" (refer to survey locations 40A and 83), and
 - Retention Tank Room.

Figure 2 depicts the posting recommendations graphically.

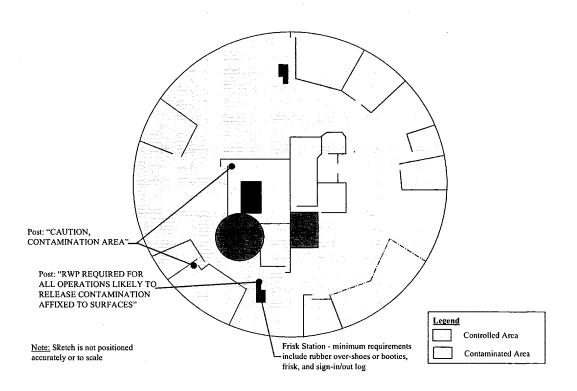


Figure 2. Basement Level: Recommended Posted Areas

Attachment 1 Contamination Survey Forms and Sketches

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Task: Annual Survey			RWP:	NA		
Map key: ° = Sample Location	☐ = Air Sampler L	ocation _	= Core Sample			
Dose Rate Abbreviations: CT/W				, GA = General A	rea	
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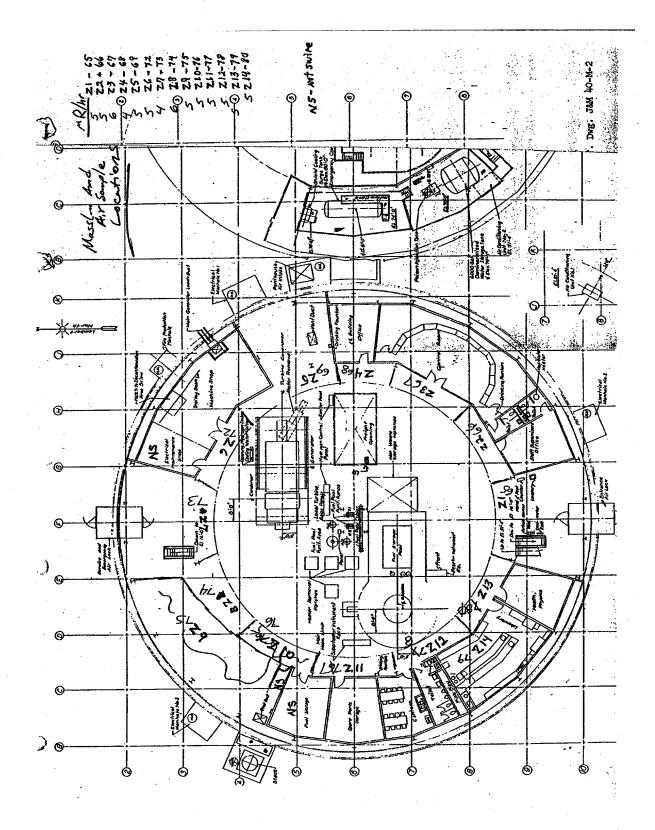
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·		ear 2002 Ann							ple-Bkg)/E			,,	
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Ì							Gross	Cour	nts in CPM		Contai	mination i	n dpm/1
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68	Main Floor-	-Maslim				400					CHOA		
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	echnician: _					12400	H.)		L		-INLA	L	<u> L</u>

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35	Basement F		·			3 <u>5</u> 12					4234	-		+
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30	Basement F	oor-Betwee	n Tk. 1-2			4		-			MIA			+
30A	Basement F	oor-Near w	all			2	-		+-+-		214/		H	+
31	Basement F	oor-Betwee	n Tk. 2-3			5			+		LMDA		\vdash	+
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43	Basement F	loor		Late	14	<u>8_</u>	1		i	LAURA		$\perp \perp \perp$
44	Basement F	loor			4	7				cup4		
45	Basement F	loor				nder	water	<u> </u>			- 1	
46	Basement F	loor			6	4	1			LniA		
47	Basement F	loor			1/	\$		The same		3260		
48	Basement F	loor			T_{Z}				1	ZUJA		1

901

992

49

38

68

544

Survey Technician:

Reviewed By:

(i Webb

MDA is removable/total in dpm/100 cm²

Page _f_ of _f_ PBR-35

Basement Floor

all (block)

Basement Floor-Wall (concrete)

49

50

50A

50B

51

52

56

55

53

54

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7056

CMDA

4/*S*08

45937

4NDA

<MDA

EMBA

973

24/36

3358

		,				./^										
Proje	ct: _	bouns		Date/Time 6/	14	102	20	Task Nu	ımber _		NA	·				
Speci	ific Ar	ea of Surve	y: Entombed	Building-Baseme	nt FI	oor	_	MDA=((2. 7 1/TI	bkg +	3.3sqrt(Bkg	/Tbkg+Bkg/T	s))/E x CI	=		
Purpo	ose of	Survey: Ye	ear 2002 Ann	ual Survev			_	A=(Sar	nple-Bk	g)/E x	CF					
	Inst.	Туре	Serial #	Cal. due date	Pro	obe type	Seria	# Ca	l. due d	late	Efficiency	Ct. Time Tbkg/Ts (minutes)	Bkg Read		MD.	
Ludiu	m 222	21	149991	615 103		44-9	1545	5 6	151	03	13.7%		5%		~201	
				1 1					, ,		%	_ /				
SURV	/EV F	ATA					S	nrev Ma	n Attac	had F	Yes □ N		-			
JUNY	Ī	'AIA		· · · · · · · · · · · · · · · · · · ·				oss Cou			1162 11		nination i	n don		2
No			Description			βγ Remova	Т	βγ Total	1	α ovable	α Total	βγ Removable	βy Total		α novable	α Tota
70				iquid Ret Tonk		84		NA		VA.	NA	>MOA	NA	N	14	MA
71	_	Maslim-Pur	np/Fan Roull	Y Light d Let. To	2/	115			L	1	1-4-	>MDA		<u> </u>	1	1
81	_			By Liguid Cut. Tim	3	1099			<u> </u>	<u> </u>	11	>MDA		<u> </u>	↓	\sqcup
81A	-	hastim-	Nutalit	whom Tank		< 5	4		-	<u> </u>		CMDA	_ \	-	 	<u> </u>
									┢┈╴		†					
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	\dashv				7		-		<u> </u>					<u> </u>		<u> </u>
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MDA is removable/total in dpm/100 cm²

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Rev. 1 (6/02)

								,						
Project:	BONUS		_ Date/Time 💅	13/0	2 095	O Tas	k Nu	mber	-	·			•	
Specific	Area of Survey	: Entombed	Building-Baseme	ent F	loor	М))=AC	2.71/Tbkg	; + 3	3.3sqrt(Bkg	/Tbkg+Bkg/T	s))/E x CF	.	
Purpose	of Survey: <u>Ye</u>	ar 2002 Ann	ual Survey			A=	(Sam	ple-Bkg)/	Εx	CF				
Iñ	st. Type	Serial #	Cal. due date	Pro	obe type	Serial #	Cal	. due date	•	Efficiency	Ct. Time Tbkg/Ts (minutes)	Bkga Readi		MDA'
Ludlum 2	2221	615 103		44-9 2	54535	61	5 10.	3	/3.7%	1012	48	87	'5	
		149991	1 1					1		. %	. /			
SURVEY	, DATA					Surve	y Mar	p Attache	d 🗆	Yes □ N	0			
SONVE	T							nts in CPN				mination is	n dpm/100 d	m²
No.		Description	/Location		βγ Removab		y ital	α Remova	able	α Total	βy Removable	βγ Total	α Removabl	e
82	Basement F		· · · · · · · · · · · · · · · · · · ·		NA	48	8	N	4	NA	NA	21411	NA	
83	Near 40A				conte	- 5k	j P					Step	\	
84	Decontamin	ation Room	Sink Pipe		~50cm	22	61				<u> </u>	10365	/_	
84D	Decontamin	ation Room-	Sink Pipe		1	26	31	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				10365		
85	Sink-Loose	debris				150	2			1/1		70754		_
86	Sump Pump					6	12	1				28905		_
87	Inlet Air Ple)	15		0	ot	\sqcup		5 255	11 10 13	4
88	Inlet Air Ple	num Room F	loor			27	8<	278	_	-/		0.101	11192	\dashv
Exomple	theat	er				7	2 -					4713	- (\dashv
							-					<u></u>		+
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<u> </u>	 									 				┪
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Page ___of___ PBR-35

MDA is removable/total in dpm/100 cm²

Rev. 1 (6/02)

Rincón, F	REACTOR Puerto Rice	FACILITY				CO	ONTAMINATIO	ON SURVI	EY FO	RM			
		S rvey: Mo					Tas	ik Numbe	r	NA		-	
Inst.	type	Serial #	Cal. Du	e date	Probe	type	Serial #	Cal. due	date	Efficiency	Ct. time	Bkgd	MDA
222	7	149991	615	103	44	1-9	154535					60	1981
			1	1				1	1	%			,
								-					
SURVEY	1					r				□ Yes □ No			 -
No.			ion/Local	tion		ŀ	(;^η βγ Removable	Counts In	β· Tot		βγ Removab	ole	pm/100 cm ² βγ Total
NA	Tonk						2156		N	4	ZMDA		- nd
	Tonk	1 Zone					82				ZMDA		
 _	Tak !		23.				83			ļ .	TMDA		$-\!\!\!\!/-$
	Tark 1		<u>e 4</u>				364		/		7MDA		
	lok!	Tank	70P				275 14	$\stackrel{\beta}{\longrightarrow}$	-+		>MDA		}
		1AS 2					19	_	\longrightarrow		< MDA		
	40A)	MASI		-		3	143		/_	\longrightarrow	7MDA		
	ļ								·				
	1											\longrightarrow	
						ļ				i i		1	

MDA is removable/tetal in dpm/1,00 cm²

MDA =

FECHNOLOGICAL MUSEUM DR. MODE Rincón, Puerto Rico	ESTO IRIARTE B	EAUCHAMP	(former BONUS REACTO	R FACILITY)	
RADIO	LOGICAL SUI	RVEY REP			4
SITE: Entombed Reactor Building	Time:	0120	Date: Yr & Mo 6	Dy_/3	1
Task: Annual Survey		RWP:	NA		4
Map key: ° = Sample Location □ = Air San	npler Location	= Core Sample	!		
Dose Rate Abbreviations: CT/WB/GA, where	CT = Contract, WI	B = Whole Boo	y, GA = General Area		
Building: Entombed Reactor Building		Location: B	asement Floor		.
Sketch:		· *;	1 = Sample Locations	N	
No. μR/hr		C .	= New Locations	^	
Zone 1= 71			1000	-	
Zone 2= 80 Zone 3= 81			Dup: 5MR		
Zone _= Zone _=			(1) 1 × 1	i	,
Zone _= Zone _=			- 6/5/2NQ	85=12,4K/1 86=11,00K/16 46=18 46=18 505 505	, d
Zone _=			ープノ	86=11nR/h	
NS=not swiped			85 86	46213	ARIM.
ununun persebun		B017 40A		Such 50	A= (
7		OB ^{CO} 63	YE	50%	Cass !
					ון אוייטרי
RAS-Air Sample	RAS-2		nia stor	Marken	
RAS-All Sample	6	20 20		12	
В	103 GD		20°2.		
		3 93 — _Z	5 - SARIET	7	
		O 00 %		#29A-8MR #82=14M	
Maslim , 70/1	TOAP OF THE	%	B023	-02-144	ام
Massim, 70 to Take on top of Takes		/		#83=27M	e
tanks Tom	·	+		- 322	`
- Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Control of the Cont	8/Tak3	J. whon		Company or so that	
	811		was A 7 46		
	(No. Y	#3o.	-7MR #29A-7MR -17MR #44A-29MR	= SCM Survey Above 188 cm² limit	
		# 304	-40AR HUMA MORMR	#50-9MR	
Instruments (Model and Serial Numbers): 19	- 143198		ane	#51-12MR #52-7MR	•
Survey Technician(s):	eves	#33-	11/1 # 47 - SME 1	\$53-14,0R \$4-14,0R \$5-6,0R	
our roy roominount of	, 	77 33 7	a Harley Park		
PBR-36		# 27 - #	ME # 45-7/ME (WILL)	61(3/62 Rev. 1)	(6/02)
			WR # 47-15MR R # 48-8MR # 49-10MR		

BONUS REACTOR FACILITY Rincón, Puerto Rico			
RADIOLOGICA	AL SURVEY	Y REPORT (N	MAP)
SITE: BONU S	Time:	7:30	Date: Yr <u>62 Mo 6 Dy 20</u>
Task: Year Zeoz Annul Survey		RWP:	-06-18-01
Map key: ○= Sample Location □= Air Sampler Lo	cation △=C	ore Sample	
Dose Rate Abbreviations: $CT/WB/GA$, where $CT = C$	ontract, WB =	Whole Body, G	A = General Area
Building: <u>BONUS</u>	 ,	Location:	Reactor LGV Station
Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural Gural		Hot Well	Mainsteam Line 404MAS2 The whole of the surface leadings 406? It is hasting to the surface standing to
Survey Technician(s):		Reviewer:	Cwebb
* 40A-406 Smears Collected Following Maslim		Maslism Areas	WHOAMASI TIMUSAMASS

BONUS REACTOR Rincón, Puerto Ric			CC	ONTAMINATIO	ON SURVEY FO	RM			
Project: <u>Bow</u> Specific Area of Su Purpose of Survey	irvey: _ <i>5</i> /		16	160 ks	sk Number	NA		•	
Inst. type	Serial #	Cal. Due date	Probe type	Serial #	Cal. due date	Efficiency	Ct. time	Bkgd	MDA
Indhun 2221	149991	61 5 103	44-9	154535	615 163	13.7%	Smallan	35	160+
		1 1			1 1	%			1

URVEY DA	.TA	Survey Ma	o Attached □ Yes □	No	
		Gross Cour	nts in CPM	Contamination	in dpm/100 cm²
No.	Description/Location	βγ Removable	βγ Total	βγ Removable	βγ Total
8	Smear	20	NA	LMDA	NA.
7		27	1	LMDA	1
6	//	31		CMDA.	
5	11	27		CMDA	
4	11	33		CMDA	
3	17	26		CMDA CMDA CMDA CMDA	
2	11	28		CMDA	
7	11	25		LM DA	
4	(1	20		CMDA	
-5	11	24		CMDA CMDA CMDA	
56	11	35		EMDA	
38	11	3.5		LMDA	

MDA is removable/total in dpm/100 cm²

BONUS REACTOR Rincón, Puerto Ric	0					ON SURVEY FO				
Project: <u>BONE</u> Specific Area of Su Purpose of Survey:		, , <u>-</u>				sk Number	NA	:		
inst. type	Serial#	Cal. Due	date	Probe type	Serial#	Cal. due date	Efficiency	Ct. time	Bkgd	MDA'
Indla 2221	149991	615	103	44-9	154535	615 103	13.7%	5ma/lan	35	160+0
		1	1			1 1	%			1

URVEY D	ATA	Survey Ma	p Attached □ Yes □	No		
ľ		Gross Cour	nts in CPM	Contamination in dpm/100 cm		
No.	Description/Location	βγ Removable	βγ Total	βγ Removable	βγ Totai	
19	Smear	33	NA	SMDA	NA	
18	11	25		<mda< td=""><td>{</td></mda<>	{	
17	11	25		LMDA		
16	. 11	29		Lu)A		
15	11	29		LMDA		
14	11	36		LMDA		
3	//	30		CMDA CMDA CMDA CMDA CMDA		
Dup	1/	40		CMDA		
2	11	29		CMOA	1.	
11	11	3/		CMDA		
10	11	36		CMDA		
9	11	22		CMDA CMDA		

MDA is removable/total-in dpm/100 cm²

Chich Sovre at 9658 can

$$MDA = \frac{2.71}{T_B} + 3.3 \sqrt{\frac{8kG}{T_B}} + \frac{8kG}{T_S}$$

$$= 160$$

$$\frac{6000}{dpm/100cm^2}$$
or $7^{MOA}_{cpm} = 57_{wrhish}$

BONUS REACTOR Rincón, Puerto Ric			CC	ONTAMINATIO	ON SURVEY FOR	RM		
Project: BON Specific Area of Su Purpose of Survey:	rvey:	means	6/14 Annew			NA		
Inst. type	Serial #	Cal. Due date		Serial #	Cal. due date	Efficiency Ct	time Bkgd	MDA.
Kidlen 2221.	149991	615 103	44-9	154535	615 103	13.7% Sm.	n/1mg 31	151 te
		1 1			-1 1	%		,

SURVEY D	ATA	Survey Mar	Attached Yes	Survey Map Attached □ Yes □ No								
		Gross Coun	ts in CPM	Contamination in dpm/100 cm								
No.	Description/Location	βγ Removable	βγ Total	βγ Removable	βγ Total							
20	Smears	57	NA	A.G.M.S	NA							
21	Smears	28	·	AGMS								
22	Smears	32		AGMY								
23	Smears	33		ZMDA								
24	Smears	29		2 MDA								
25	SORARS	28		L MDA								
26	Smears	33		L M DA								
27	Smeals	37		Z MDA								
274	DMEARS	26		LMDA								
213	STORAGE	26	· 1	ZMDA								
28	Smears	38		ZMS								

$$MDA = \frac{2.71}{T_B} + \frac{3.3}{T_B} + \frac{Bck}{T_S}$$

BONUS REACTOR Rincón, Puerto Ric			CC	OTAMINATIO	ON SURVEY FOI	RM						
Project: BONUS Date/Time 6/13/02 Task Number 1/4 Specific Area of Survey: Snears Purpose of Survey: Year 2002 Annual Survey												
Inst. type	Serial #	Ċal. Due date	Probe type	Serial #	Cal. due date	Efficiency	Ct. time	Bkgd	MDA.			
Luden 2221	149991	61 5 103	44-9	154535	61 5103	13.7%	Smit /lan	35	160+0			
		1 1			1 1	%			1			

URVEY	DATA	Survey Ma	p Attached □ Yes □	No			
	•	Gross Cou	nts in CPM	Contamination in dpm/100 cm			
No.	Description/Location	βγ Removable	βγ Total	βγ Removable	βγ Total		
82	Smear	35	MA	<mda< td=""><td>NA</td></mda<>	NA		
84		23		-MDA	l i		
33	11	33		LMDA			
41		38		CMDA			
40B	11 -	91		409			
40B Dug	"	84		358			
40A	11	191		1/39	17		
40		3/		LMDA	1 1		
39	- 11	39		CMDA			
38	"	47		LMDA	1		
36A	//	26		CMDA CMDA	11		
30	11	36		LMDA			

BONUS REACTOR FACILITY Rincón, Puerto Rico CONTAMINATION SURVEY FORM											
Project: BONUS Date/Time 6/13/02 Task Number NA Specific Area of Survey: Smears 1715 Purpose of Survey: Year 2002 Annual Survey											
Inst. type	Serial #	Cal. Due d	ate Probe type	Serial #	Cal. due d	date	Efficiency	Buk Ismp Ct. time	Bkgd	MDA*	
Indlan 2221	149991	6151	03 44-9	154 535	615	103	13.7 %	Sminlinn	35	160 te	
		1 1			1	,	%			,	

SURVEY D	DATA	Survey Ma	p Attached □ Yes □ No			
		Gross Cou	ints in CPM	Contamination in dpm/100 cm ²		
No.	Description/Location	βγ Removable	βγ Total	βγ Removable	βγ Total	
51	Smear	29	NA	LMDA	NA	
51 Due	//	26)	LMDA		
9.4	Paint Chips on smear	32.		LMDA ZMDA LMDA	<u> </u>	
34	Paint Chips on smear Paint Chips	36	7	LMDA	. (
	14011 9.71				7	
					·-··	

BONUS REACTOR Rincón, Puerto Ric			Co	ONTAMINATION	ON SURVEY FO	RM			
Project: Bon Specific Area of Si Purpose of Survey	ırvey: <u>_</u>	mears	16	30 ms	sk Number	NA		•	
Inst. type	Serial #	Cal. Due date	Probe type	Serial #	Cal. due date	Efficiency	Sc2c/sign Ct. time	Bkgd	MDA'
Ludlan 2221	149991	615 103	44-9	154535	615 103	/3.7%	5mm/lain	35	160+0
	<u> </u>	1 1			1 1	%			1

SURVEY DA	TA	Survey Ma	p Attached 🗆 Yes 🗅	No			
	•	Gross Cou	nts in CPM	Contamination in dpm/100 cm			
No.	Description/Location	βγ Removable	βγ Total	βγ Removable	βγ Total		
53	Smear	69	NA	248	NA		
52	11	30		2MDA	/		
87	11	25		LMDA			
3/	11	3.3		LMDA			
44	11	3/		LM DA			
86	11	3.5		LMDA			
42.	11	3/		-MDA			
35	//	39		LMDA			
34	//	51		LMDA			
43	11	40 .		< MDA			
13 Dup	"	35		<mda< td=""><td></td></mda<>			
36	11	21		LMDA			

BONUS REACTOR Rincón, Puerto Ric	BONUS REACTOR FACILITY Rincón, Puerto Rico CONTAMINATION SURVEY FORM												
Project: Bowns Date/Time 6/13/02 Task Number NA Specific Area of Survey: 5 mears 1700 hrs Purpose of Survey: Year 2002 Annul Survey													
Inst. type	Serial #	Cal. Due date	Probe type	Serial #	Cal. due date	Efficiency	Ct. time	Bkgđ	MDA*				
Ludbun 2221	149991	61 5 163	44-9	154535	615 103	13.7%	Smallain	35	160+0				
		1 1			1 1	%			1				

SURVEY	DATA	Survey Ma	p Attached Ves	No		
		Gross Cou	Contamination in dpm/100 cm ²			
No.	Description/Location	βγ Removable	βγ Total	βγ Removable	βγ Total	
85	Smear	57	NA	161	NA	
32	- 11	24	1	LMDA		
37	1/	24	·	CMDA		
29	17	27		EMDA		
29A	11	30		EMDA		
46	//	37.		CMDA		
47	//	37		2MDA		
50	11	2		< MDA		
48	//	31		LMDA		
49	1/	29		EMDA		
50A	11	32		ZMDA		
50B	//	36	(Emi) A	V	

Project: <u>BOT</u> Specific Area of Su Purpose of Survey	irvey: S				_		/A	-	
Inst. type	Serial #			/pe Serial#	Cal. due da			Bkgd	N
Lud lum 2221	149991	6,5,03	44-9	7 154535	6151	03/3/7%	5,000//00	32	153
						· · · · · · · · · · · · · · · · · · ·	<u> </u>		
SURVEY DATA						ed - Yes - No			
ĺ			-		Counts in Ci			ination in d	
No.	Descript	ion/Location		βγ Removable		βγ Total	βγ Removal	ble all 12	S Tot
A to 1	ig Ret	Tan K 4 1	\bot	41			284	672	
2 /19.	He1/	ank#1		101			504,0	90	
2 7/9'	net 1	Tank#1		474 678			5416 4,715	120	
-/-	re	1911111		410	- -		17 = 13	1,22	
	*								
									_
									
		· · · · · · · · · · · · · · · · · · ·			_				
									\rightarrow
			-+		-				
Survey Technician: Reviewed By:	Car C- L	165 V.							ス
	MDA is,	removable/tetal l	m dpm/10	0 cm²				 .	
				+ 3.3		kg icount			

	BONUS REACTOR FACILITY Rincón, Puerto Rico CONTAMINATION SURVEY FORM										
Project: 1501/ Specific Area of Su Purpose of Survey:	rvey:	Sme	<u>~S</u>			sk Number	·	N+	4	•	
Inst. type	Serial#	Cal. Du	e date	Probe type	Serial #	Cal. due	date	Efficiency	Ct. time	Bkgd	MDA*
Gudlum 2221	149991	615	103	44-9	154535	615	103	13.7%	Somlan	32	153+
		1	1			1	1	%			1

SURVEY D	ATA	Survey Map Attached □ Yes □ No							
		Gross Cour	nts in CPM	Contamination in	Contamination in dpm/100 cm ²				
No.	Description/Location	βγ Removable	βγ Total	βγ Removable	βγ Totai				
40A	Smear-Susketch	78	NA	335-77-cm	MA				
4013	//	53)	153					
40 C	• •	25	/	2MDA					
40 D	11	34		CMDA	4.				
40 E	. 17	1//		372	1				
40 F	i l	48		LMDA					
400	/1	32	(CMDA CMDA	(
Survey Tec Reviewed I	chnician: <u>Carlos V.</u> 3y: <u>Curebb</u>								

** These snears were collected offer a mastim was performed on these surfaces,

Attachment 2
Instrument Calibration
and Response Check Forms

Designer and Manufacturer of Scientific and Industrial

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.

POST OFFICE BOX 810 PH. 915-235-5494 501 OAK STREET FAX NO. 915-235-4672 instruments SWEETWATER, TEXAS 79556, U.S.A. PUERTO RICO ELECTRIC POWER 280769/264221 ORDER NO. Serial No. 14 9991 Ludlum Measurements, Inc. Serial No. PR 154535 Ludium Measurements, Inc. 44-9 5-Jun-02 __ Cal Due Date 5-Jun-03 Cal. Interval_ 1 Year Meterface Cal. Date neck mark 🗹 applies to applicable instr. and/or detector IAW mfg. spec. I. ___ <u>73</u> °F RH____39_% Alt____ 696.8 mm Hg 🗍 New instrument – Instrument Received – 🗍 Within Toler. +-10% – 10-20% – Out of Tol. 🖵 Requiring Repair 🔲 Other-See comments ✓ Mechanical ck. ✓ Meter Zeroed ☐ Background Subtract ☑ Input Sens. Linearity √ F/S Resp. ck ✓ Window Operation✓ Batt. ck. (Min. Volt) Reset ck. ☑ Geotropism Audio ck. Alarm Setting ck. 5.0_VDC Calibrated in accordance with LMI SOP 14.9 rev 02/07/97. Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. V at 50 mV Dial Ratio strument Volt Set 900 V Input Sens. 50 mV Det. Oper. 900 HV Readout (2 points) Ref./Inst._ 502 500 __ V Ref./Inst._ EW 6/13/02 per telecus wy Ludlum COMMENTS: 9 EW 6/13/62 per telecon w/ Ludlum 3rY-90 source s/n:0465 reads 2016cpm @ 1/4'' from the probe surface. 10-60 efficiency is 11.6%(4 pi) source size:28,627 dpm source count:3,482 cpm background:163cpm s/n:0886 3rY-90 efficiency is 31.0%(4 pi) source size:45,946 dpm source count:14,453 cpm background:163cpm i-63 efficiency is .06%(4 pi) source size:298,539 dpm source count:358 cpm background:163cpm s/n:4017 :s-137(gamma) efficiency is 0.11%(4 pi) source size:2,359,041 source count:2,664cpm background:163 cpm :/n:0155 :s-137(beta) efficiency is 17.25%(4 pi) source size:7,697 source count:1,491cpm background:163 cpm ;/n:158-112 ill efficiencies taken at 1/4" from protective screen of 44-9 All efficiencies 1/4" from Probe umma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source. FIRMWARC VERSION: 26 10 10 REFERENCE INSTRUMENT REC'D INSTRUMENT RANGE/MULTIPLIER CAL POINT "AS FOUND READING" METER READING* X 1000 400 Kcpm 400 X 1000 100 Kcpm 100 X 100 400 40 Kcpm X 100 10 Kcom 100 X 10 4 Kcpm 400 X 10 1 Kcpm 100 400 X1 400 cpm X 1 100 cpm 100 ALL Range(s) Calibrated Electronically *Uncertainty within ± 10% C.F. within ± 20% INSTRUMENT REFERENCE INSTRUMENT INSTRUMENT REFERENCE INSTRUMENT CAL. POINT RECEIVED METER READING* CAL POINT RECEIVED METER READING* 398976) 450 K 400 K cpm 500 K cpm 3992(0) 40 K cpm 50 K cpm 399(0) 4 K cpm 5 K cpm 40(0) 500 cpm 400 cpm 40 cpm 4(0) 50 cpm 50 dium Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of aer international Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ation type of calibration techniques.

State of Fixess Calibration Licenses No. LCO-1954 Reference Instruments and/or Sources: :s-137 Gamma S/N ☐1162 ☑ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☑ E551 Neutron Am-241 Be S/N T-304 Beta S/N _ __ Dther Multimeter S/N √ m 500 S/N Oscilloscope S/N_ Date 5 June - 02 Calibrated By: Date 51 Reviewed By: AC Inst. Passed Dielectric (Hi-Pot) and Continuity Test
Only Folled: This certificate shall not be reproduced except in full, without the written approval of Ludium Measurements, Inc. FORM C22A 10/31/2001



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 FAX NO. 915-235-4672

SWEETWATER, TEXAS 79556, U.S.A.

CONVERSION CHART

Custome	r PUERTO RICO ELECTRIC	POWER	Date	5-Jun-02	_ Order #	280769/264221
Model	222] Serial No	49991	Detector Model	44-9	_ Serial No	154535
Source _	Cs-137 194.6 mCl	Cs-137 20 mC	<u> </u>	1	High Voltage	900 v
				Inpu	Sensitivity _	50 mv
		"As Found" F	Readings (CPM):	After	Adjustment R	eadings (CPM):
	Reference Point	Analog	Range/Scale	_	nalog	Range/Scale
	150 mR/hr				OOMIT	XIK
	50		1/	1	40	XIK
	15		1/4		40	XIK
	5		///		60	X100
	1.5				50	X100
					30	X 100
-	Reference Point	"As Found" Digital	* Readings: Count Time		ter Adjustmen Digital	t Readings:
,	150 mR/hr			310	72	6 sec
_	50		11	14	125	
_	15		//	47	117	
	3	/	/ /		621	
<u>-</u>	1.5				502	
_	1 1				323	
Signature	: Michael J	Thomas		Date5	June -	02

Designer and Manufacturer of Scientific and industrial Instruments

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 79556, U.S.A.

CUSTOMER	PUERTO RICO EL	ECTRIC POWER				ORDER NO	280796/264221
VIfgLuc	llum Measurem	ents, Inc. M	odel		Serial	No. 14819	0
Vlfg.			odel				
			e Date 4-J				nce 202-016
							696.8 mm Ha
			detector IAW mfg. spec.				
☐ New Instrum ☐			Within Toler. +-10%				
✓ Mechanical✓ F/S Resp. ck✓ Audio ck.☐ Calibrated in	accordance w	Meter Zeroe Reset ck. Alarm Settin th LMI SOP 14.8 re		Morated in acc	lon bit)22_VD0 cordance with I M	1LSOP 14 9 rev 02/	m 17/97
	out (2 points)	Ref./Inst	/	V	Ref./Inst		v
							· · · · · · · · · · · · · · · · · · ·
			orce s/n: 200 on & Centere			ripi C 01	m-19 can
mma Calibration: GM de	tectors positioned perpe	ndicular to source except fo	or M 44-9 in which the front of probe fa				
			ERENCE		ENT REC'D	INSTRUMEN	
	GE/MULTIPLIE	· ·	AL. POINT		ID READING"	METER REA	_ · · · · -
500		4000 µ		350	20	1000	
500		1000 µ			00	400	
500			hr = 72,500 cpm	$\frac{1}{1}$	0	110	
500		100 µ	₹/Dr			200	
250			hr = 36,300 cpm	200		110	
250)	100 µ		<u> </u>	0	40	
50		mir 1 2 72500			0	10	
50		1810	•			20	· · · · · · · · · · · · · · · · · · ·
25		1.00	pm		<u></u>		
25		901	pm , mq	·	>	`	
*Uncertai	nty within ± 10%	C.F. within ± 20%	<u> </u>		50, 2	5 Range(s) Calib	ated Electronically
REFERE	NCE I	NSTRUMENT	INSTRUMENT	REFERE	NCE IN	STRUMENT	INSTRUMENT
CAL P	I TAIC	RECEIVED	METER READING*	CAL PO	DINT RE	CEIVED	METER READING*
gital			Į Ļ	og _.			
eadout				căle			***************************************
	 -						
	·	 					
		<u> </u>					
ner International Stand	tards Organization m	embers, or have been o	een colibrated by standards trace derived from accepted values of 40-1-1994 and ANSI N323-1978	eable to the Nation natural physical co	astonts of nave been a	BUYER BY INDICARO INDICA	he calibration facilities of of calibration techniques. on License No. LO-1963
Reference instru							
2s-137 Gamma S/N	□1162 □G1	12 M565 51	05 🗌 T1008 🗌 T879 🔲 E	552 🗆 E551		Neut	ron Am-241 Be S/N T-304
Alpha S/N_		C			Cither	r <u></u>	
☑ m 500 S/N _	81084	77	Oscilloscope S/N		Multir	neter S/N	80040300
Calibrated By:	Michael	1 Tha	nae	****	Date 4-Jul	1e-02	<u> 1600년 (305.)</u> 본 (307. 14 회사)
Reviewed By:	Kharda	Hames		· · · · · · · · · · · · · · · · · · ·	Date 5 Jan	v05	
This certificate shall no FORM C22A 10/31/2		ept in full, without the v	written approval of Ludium Measu	irements, Inc.	AC Inst. Pas Only Faile	ssed Dielectric (HI-Poi ed:) and Continuity Test

Designer and Manufacturer of Scientific and Industrial Instruments

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 FAX NO. 915-235-4672
 SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER	PUERTO RICO ELI	ECTRIC POWER				ORDER NO.	280769/264221
Mfg	Ludium Measureme	ents, Inc Mo	del	3	Se	rial No. <u>14781</u>	
Mfg.						rial No. PR 154	1536
Cal. Date	5-Jun-02					1 Year Meterfo	ace 202-608
	applies to applica		•				696.8_ mm Hg
☐ New In	nstrument Instrumer	nt Received N	/Ithin Toler. +-10%	110-20% □ Out	of Tol. 🗌 Req	uiring Repair 🔲 Othe	er-See comments
Mecha	anical ck. sp. ck ck. ted in accordance w	✓ Meter Zeroed ✓ Reset ck. ✓ Alarm Setting	Ck. 12/05/89. II	Background Sub Window Operat Batt. ck. (Min. Vo	otract ion olt)22_'	☐ Input Sens ☑ Geotropis VDC I IMI SOP 14.9 rev 02/6	s. Linearity m 07/97.
strument V	olt Set 900	V Input Sens3	mV Det. Ope	er. <u>900</u> V	/ at <u>34</u>	mv Dial Ratio	=
	Readout (2 points)				Ref./Inst		V
00-60 eff 3rY-90 eff s/n:4016 Ni-63 eff Cs-137 (ga s/n:0155 Cs-137 (be s/n:158-1	ource s/n:0465 r ficiency is 12.4 fficiency is 33. ficiency is 0.13 amma) efficiency	%(4 pi) source 38%(4 pi) source (4 pi) source (is 0.13%(4 pi) is 20.14%(4 pi)	e size:28,627 d rce size:45,946 e size:298,539d i) source size: i) source size:	pm source coundpm source pm source coundpm 2,359,041dpm 7,697dpm source	unt:3,600cg count:16,0 unt:450cpm source cou	om background:50 000cpm background background:50cp unt:3000cpm back	d:50cpm om s/n:4017 ground:50cpm
amma Caubrauon	n: GM delectors positioned perpe		ERENCE		ENT REC'D	INSTRUMEN	IT .
. 1	RANGE/MULTIPLIE		POINT		ND READING		
	X 100	150 mR	/hr		1. 7	1.5	<u>) </u>
	X 100 ·	50 mR			0.6		<u>q</u>
-	X 10	15 mR			· 4 2		<u> </u>
-	<u>X 10</u>	5 mR). <u>5</u>		<u>} </u>
-	X1 X1	1.0 mR	11= 4420 cpm		i T		<u>, </u>
-	X 0.1	442 cr		1. 4	<u>: </u>	7,5	
•	X 0.1	147 cr		0	5	0.5	
			211.1				
			*				
*Ur	ncertainty within ± 10%	C.F. within ± 20%	<u> </u>			X0.1 Range(s) Calib	rated Electronically
		nstrument	INSTRUMENT	REFERE		INSTRUMENT	INSTRUMENT
	CAL. POINT	RECEIVED	METER READING*	CAL, PI	OINT	RECEIVED	METER READING*
igital eadout				Log Scale			
_							
-							
_			 				
							
ration Measurer oottonethor	ments, inc. certifies that the o al Standards Organization m	bove instrument has been de embers, or have been de	en collbrated by standards : stved from accepted value	traceable to the Nation is of natural physical co	ial institute of Stanc instants or have be	dards and Technology, or to the derived by the ratio type.	he calibration facilities of of colibration techniques.
ne calibration sy	ystem conforms to the require	ements of ANSI/NCSL 254	3-1-1994 and ANSI N323-197	8	•	State of Texas Calibrati	on Ucense No. LO-1963
	i Instruments and/oi mas/N 🗌 1162 🗹 G11		:	Tesso [Xess]		□ No.d	
		_			_	*	TON Am-241 Be \$/N T-304
☐ Alpha	1 S/N	LJ	Beta S/N		🗆 0	ther	
√ m 500	0 S/N 81084	7-1P	Oscilloscope S/N		🗹 M	ultimeter S/N	80040300
Calibrated	By: Muchaef	1 Thos	nas		Date _ 5 -	June-02	
Reviewed	By: Rhand	. Hami			Date <u>5</u>	tru os	·
This certificate FORM C22A	shall not be reproduced exc 10/31/2001	cept in full, without the wr	itten approval of Ludium Mi	easurements, Inc.	AC Inst. Only	Passed Dielectric (Hi-Po	f) and Continuity Test

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AC Inst. Passed Dielectric (HI-Pot) and Continuity Test
Only Failed:

POST OFFICE BOX 810 PH. 915-235-5494 501 OAK STREET FAX NO. 915-235-4672 Instruments SWEETWATER, TEXAS 79556, U.S.A. ORDER NO. 280769/264221 PUERTO RICO ELECTRIC POWER Serial No. 150960 Ludium Measurements, Inc. Model Serial No. PR 154511 44-9 Ludium Measurements, Inc. Model __ Cal. Interval ____1 Year __ Meterface__ 5-Jun-02 Cal Due Date 5-Jun-03 RH 39 % Alt 696.8 mm Hg heck mark 📝 applies to applicable instr. and/or detector IAW mfg. spec. I. ___ 73 °F New instrument Instrument Received Within Toler. +10% 10-20% Out of Tol. Requiring Repair Other-See comments Background Subtract Input Sens. Linearity Mechanical ck. ✓ Meter Zeroed ✓ F/S Resp. ck Reset ck. Window Operation ✓ Geotropism Alarm Setting ck. Batt.ck (Min. Voit) 22 VDC Audio ck. [A Calibrated in accordance with LMI SOP 14.9 rev 02/07/97. Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. strument Volt Set 900 V Input Sens. 34 mV Det. Oper. 900 V at 34 mV Dia Ratio V Ref./Inst. HV Readout (2 points) Ref./Inst. COMMENTS: 3ry-90 source s/n:0465 reads 0.3 mR/hr @x 10 (3 mR/hr) @ 1/4" from the probe surface. :0-60 efficiency is 12.4%(4 pi) source size:28,627 dpm source count:3,492cpm background:50cpm s/n:0886 3rY-90 efficiency is 36.8%(4 pi) source size:45,946 dpm source count:14,453cpm background:50cpm Vi-63 efficiency is 0.10%(4 pi) source size:298,539dpm source count:350cpm background:50cpm s/n:4017 2s-137 (gamma) efficiency is 0.13% (4 pi) source size:2,359,041dpm source count:3000cpm background:50cpm :s-137(beta) efficiency is 20.14%(4 pi) source size:7,697dpm source count:1600cpm background:50cpm 3/n:158-112 All efficiencies 1/4" from Probe front of probe faces source INSTRUMENT REC'D INSTRUMENT REFERENCE "AS FOUND READING" METER READING* RANGE/MULTIPLIER CAL, POINT 150 mR/hr 1.25 __X 100 0.4 X 100 50 mR/hr 0. 15 mR/hr X 10 X 10 5 mR/hr 1.5 mR/hr= 4,490 cpm 1.45 X1 X 1 1.0 mR/hr. 449 cpm X 0.1 0.49 X0.1 150 cpm X0.1 Range(s) Calibrated Electronically *Uncertainty within ± 10% C.F. within ± 20% INSTRUMENT INSTRUMENT REFERENCE INSTRUMENT INSTRUMENT REFERENCE CAL. POINT METER READING! CAL. POINT RECEIVED METER READING* RECEIVED igital ∋adout dium Measurements, Inc. certifies that the above instrument has been collocated by standards traceable to the National Institute of Standards and Technology, or to the collocation facilities of ner international Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of collocation techniques, a calibration system conforms to the requirements of ANS/INCS. 2540-1-1994 and ANSI N323-1978

State of Texas Calibration License No., LO-1963 Reference Instruments and/or Sources: Neutron Am-241 Be S/N T-304 Beta S/N __ Other _ ☐ Alpha S/N ✓ Multimeter S/N_ 81084 Oscilloscope S/N 4 10 Calibrated By: _ 5-June-02 Date 5 / 1 03 Reviewed By:

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 SWEETWATER, TEXAS 79556, U.S.A.

Functional Check

Customer PUERTO RICO ELECTRIC		Order #.	280769/264221		
This Certifies that Ludium Model	180-2	Serial No	141329	has bee	n functionally checked.
Refer to applicable instrument manu	uals for specific	operating instr	uctions.		
				-	
	•				
		•			
					- 1 - 5
Check performed by		<u>5′</u> -		Date C	5 Jun 02

Attachment 3
Access Control Form

PREPA BONUS REACTOR FACILITY ACCESS CONTROL FORM

Page __ of __

Location:____

	I	TIME	T	Times	May Dago Date
NAME	DATE	TIME	Cohodulad Astivitus	Time	Max. Dose Rate (uR/hr) ^b
NAME Print	DATE	In	Scheduled Activity ^a	Out	(uk/nr)
Signature					
Print					
Signature					
Print		-			
Signature					
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^aThis form is intended to track access to a Controlled Area for activities that do not require an RWP. If an RWP is required, contact the RCM or designee or sign in on the appropriate existing RWP Entry Control Form.

^bIn addition to frisking requirements, a Micro-R Meter should be used to estimate the maximum exposure rate encountered.